

## CLAIMS

1. An encoding apparatus for encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

5       input means for inputting images of frames;  
          section division means for dividing the frames into a plurality of sections on the basis of the images of the frames input by said input means;

          representative image setting means for setting  
10   one representative image that represents the image of each frame in each of the sections divided by said section division means; and

          reference image selection means for selecting one representative image to be referred to so as to encode  
15   an image of a frame of interest from the representative images set for respective sections, and

          in that the image of the frame of interest is encoded by motion compensation using the images of the frames in the section that includes the representative  
20   image selected by said reference image selection means.

2. An encoding apparatus for encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

25       input means for inputting images of frames;

section division means for dividing the frames into a plurality of sections on the basis of the images of the frames input by said input means;

representative image setting means for setting  
5 one representative image that represents the image of each frame in each of the sections divided by said section division means; and

reference image selection means for selecting one representative image to be referred to so as to encode  
10 an image of a frame of interest from the representative images set for respective sections, and

in that the image of the frame of interest is encoded by motion compensation using the representative image selected by said reference image selection means.  
15

3. The apparatus according to claim 1, characterized in that said section division means comprises difference determination means for determining with reference to images of frames in an  
20 order said input means inputs whether or not an image difference between neighboring frames is not less than a predetermined value, and

when said difference determination means refers to images in turn from an image of a first frame, and  
25 determines that a difference between an image of a second frame and an image of a third frame as a next frame of the second frame is not less than the

predetermined value, said difference determination means sets the first and second frames as one section.

4. The apparatus according to claim 1,  
5 characterized in that said representative image setting means sets, as a representative image, an image of a self frame, which has a smallest sum total value of differences from a group of images of other frames in each of the sections divided by said section division  
10 means.

5. The apparatus according to claim 1,  
characterized in that said reference image selection means calculates prediction errors of motion  
15 compensation with an image of a frame to be encoded for respective representative images set in the respective sections, and selects the representative image that minimizes the prediction error.

20 6. The apparatus according to claim 1,  
characterized in that the difference is a sum total value obtained by summing up differences between pixel values of corresponding pixels in two images for all or some pixels that form the images.

7. The apparatus according to claim 1,  
characterized in that said section division means  
further comprises:

determination means for determining whether or  
5 not a frame of interest is included in a section to  
which a frame immediately before the frame of interest  
belongs;

first setting means for, when the frame of  
interest is included in the section to which the frame  
10 immediately before the frame of interest belongs,  
setting the representative frame set in the section or  
the frame of interest as a new representative image in  
the section on the basis of images of respective frames  
in the section and an image of the frame of interest;  
15 and

second setting means for, when the frame of  
interest is not included in the section to which the  
frame immediately before the frame of interest belongs,  
setting a new section which is different from the  
20 section and includes the frame of interest.

8. The apparatus according to claim 7,  
characterized in that said determination means  
calculates a difference between an image of a last  
25 frame of the section to which the frame immediately  
before the frame of interest belongs, and the image of  
the frame of interest, and when the calculated

difference is not more than a predetermined threshold, said determination means determines that the frame of interest is included in the section to which the frame immediately before the frame of interest belongs.

5

9. The apparatus according to claim 7, characterized in that said first setting means further comprises:

first calculation means for calculating  
10 differences between respective frames in the section, and the frame of interest, and calculating a sum total value of the calculated differences;

second calculation means for calculating a  
difference between the representative frame set in the  
15 section and the image of the frame of interest;

representative frame setting means for, when a  
sum of the value calculated by said second calculation  
means and a threshold is not less than the sum total  
value calculated by said first calculation means,  
20 setting the frame of interest as a new representative frame in the section;

first threshold setting means for, when the sum  
value is not less than the sum total value calculated  
by said first calculation means, setting the sum total  
25 value calculated by said first calculation means as the threshold; and

second threshold means for, when the sum value is not more than the sum total value calculated by said first calculation means, setting the sum value as the threshold.

5

10. An encoding apparatus for encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

input means for inputting images of frames for  
10 every predetermined number of frames;

representative image setting means for setting one representative image that represents images of the predetermined number of frames on the basis of the images of the frames for every predetermined number of  
15 frames; and

output means for outputting encoded results of the images of the frames input by said input means together with information required to specify the representative image.

20

11. A decoding apparatus for decoding an encoded result of images of frames that form a moving image by motion compensation, characterized by comprising:

input means for inputting encoded results of  
25 images of frames for a predetermined number of frames, and information required to specify a representative frame which represents the frames for the predetermined

number of frames, which is appended to each of the encoded results of the frames; and

storage means for storing a decoded result of the representative frame specified by the information, and

5        in that the encoded result of an image of each frame input by said input means after the representative frame stored in said storage means is decoded using the decoded result of the representative frame stored in said storage means.

10

12. An encoding apparatus for encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

input means for inputting images of frames;

15        setting means for setting an image of a frame input at a predetermined cycle of the images of the frames input by said input means as an image of a representative frame;

switching means for switching an encoding method  
20        depending on whether or not a frame to be encoded is a representative frame; and

output means for outputting encoded results of the images of the frames input by said input means together with information required to specify the  
25        representative frame.

13. An encoding apparatus for encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

input means for inputting images of frames for  
5 every predetermined number of frames;

calculation means for calculating a difference between an image of a frame input by said input means and a decoded image obtained by decoding a result of encoding the image of the frame;

10 determination means for determining an image of a frame having a smallest difference of the differences calculated by said calculation means for the frames for the predetermined number of frames as a representative image that represents the images of the frames for the  
15 predetermined number of frames; and

output means for outputting encoded results of the images of the frames input by said input means together with information required to specify the representative frame.

20

14. An encoding apparatus for encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

input means for inputting images of frames;

25 storage means for storing an image of a representative frame to be referred to when inter-frame



encoding is applied to an input image input by said input means;

calculation means for calculating similarity levels of images stored in said storage means with the  
5 input image;

storage control means for, when a minimum similarity level of the similarity levels calculated by said calculation means for the images stored in said storage means is not less than a predetermined value,  
10 storing the input image in said storage means as a representative frame; and

output means for outputting encoded results of the images of the frames input by said input means together with information required to specify the  
15 representative image.

15. An encoding apparatus for encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

20 input means for inputting images of frames;

storage means for storing an image of a representative frame to be referred to when inter-frame encoding is applied to an input image input by said input means;

25 motion vector calculation means for calculating motion vectors with the input image for images stored in said storage means;

calculation means for calculating errors of the motion vectors calculated by said motion vector calculation means for the images stored in said storage means;

5            storage control means for, when a minimum error of the errors calculated by said calculation means for the images stored in said storage means is not more than a predetermined value, storing the input image in said storage means as a representative frame; and  
10           output means for outputting encoded results of the images of the frames input by said input means using the motion vectors together with information required to specify the representative image.

15           16. An encoding method of encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

             an input step of inputting images of frames;  
             a section division step of dividing the frames  
20       into a plurality of sections on the basis of the images of the frames input in the input step;

             a representative image setting step of setting one representative image that represents the image of each frame in each of the sections divided in the  
25       section division step; and

             a reference image selection step of selecting one representative image to be referred to so as to encode

an image of a frame of interest from the representative images set for respective sections, and

in that the image of the frame of interest is encoded by motion compensation using the images of the frames in the section that includes the representative image selected in the reference image selection step.

17. An encoding method of encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

an input step of inputting images of frames;  
a section division step of dividing the frames into a plurality of sections on the basis of the images of the frames input in the input step;  
a representative image setting step of setting one representative image that represents the image of each frame in each of the sections divided in the section division step; and

a reference image selection step of selecting one representative image to be referred to so as to encode an image of a frame of interest from the representative images set for respective sections, and

in that the image of the frame of interest is encoded by motion compensation using the representative image selected in the reference image selection step.

18. An encoding method of encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

an input step of inputting images of frames for  
5 every predetermined number of frames;

a representative image setting step of setting one representative image that represents images of the predetermined number of frames on the basis of the images of the frames for every predetermined number of  
10 frames; and

an output step of outputting encoded results of the images of the frames input in the input step together with information required to specify the representative image.

15

19. A decoding method of decoding an encoded result of images of frames that form a moving image by motion compensation, characterized by comprising:

an input step of inputting encoded results of  
20 images of frames for a predetermined number of frames, and information required to specify a representative frame which represents the frames for the predetermined number of frames, which is appended to each of the encoded results of the frames; and

25 a storage step of storing a decoded result of the representative frame specified by the information, and

in that the encoded result of an image of each frame input in the input step after the representative frame stored in the storage step is decoded using the decoded result of the representative frame stored in  
5 the storage step.

20. An encoding method of encoding images of frames, which form a moving image by motion compensation, characterized by comprising:
- 10       an input step of inputting images of frames;  
          a setting step of setting an image of a frame input at a predetermined cycle of the images of the frames input in the input step as an image of a representative frame;
- 15       a switching step of switching an encoding method depending on whether or not a frame to be encoded is a representative frame; and  
          an output step of outputting encoded results of the images of the frames input in the input step  
20 together with information required to specify the representative frame.

21. An encoding method of encoding images of frames, which form a moving image by motion  
25 compensation, characterized by comprising:  
          an input step of inputting images of frames for every predetermined number of frames;

a calculation step of calculating a difference between an image of a frame input in the input step and a decoded image obtained by decoding a result of encoding the image of the frame;

5           a determination step of determining an image of a frame having a smallest difference of the differences calculated in the calculation step for the frames for the predetermined number of frames as a representative image that represents the images of the frames for the  
10   predetermined number of frames; and

an output step of outputting encoded results of the images of the frames input in the input step together with information required to specify the representative frame.

15

22. An encoding method of encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

an input step of inputting images of frames;  
20           a storage step of storing an image of a representative frame to be referred to when inter-frame encoding is applied to an input image input in the input step;

a calculation step of calculating similarity  
25   levels of images stored in the storage step with the input image;

a storage control step of storing, when a minimum similarity level of the similarity levels calculated by the calculation step for the images stored in the storage step is not less than a predetermined value,

5 the input image in the storage step as a representative frame; and

an output step of outputting encoded results of the images of the frames input in the input step together with information required to specify the  
10 representative image.

23. An encoding method of encoding images of frames, which form a moving image by motion compensation, characterized by comprising:

15 an input step of inputting images of frames;

a storage step of storing an image of a representative frame to be referred to when inter-frame encoding is applied to an input image input in the input step;

20 a motion vector calculation step of calculating motion vectors with the input image for images stored in the storage step;

a calculation step of calculating errors of the motion vectors calculated in the motion vector  
25 calculation step for the images stored in the storage step;

a storage control step of storing, when a minimum error of the errors calculated in the calculation step for the images stored in the storage step is not more than a predetermined value, the input image in the storage step as a representative frame; and

an output step of outputting encoded results of the images of the frames input in the input step using the motion vectors together with information required to specify the representative image.

10

24. A program characterized by making a computer execute an encoding method of claim 16.

25. A program characterized by making a computer execute a decoding method of claim 19.

15

26. A program characterized by making a computer execute an encoding method of claim 20.

27. A computer-readable storage medium characterized by storing a program of claim 24.

20

28. A computer-readable storage medium characterized by storing a program of claim 25.

25

29. A computer-readable storage medium characterized by storing a program of claim 26.